though most clasts are well rounded, clasts of sedimentary rock ar

transluscent varieties of chert, greenish-gray aphanitic, porphyritic

typically enlongate parallel to bedding. Clasts include greenish-

gray, bright greenish-gray, gray, reddish-brown, and light-gray

vesicular, and nonvesicular mafic igneous rocks, light-gray to

argillite, organic shale, and granitic rocks. Conglomerate is

prominent parting lineation and a flaggy weathering character.

gravel lenses with abundant wood debris and marine mollusks.

medium - light - gray limestone and dolomitic limestone, silicified

interbedded with and grades abruptly to marine sandstone including

fine to coarse grained thin bedded to laminated sandstone with very

Sandstone includes scarce shell and wood debris. Sandstone is also

locally cross bedded, bioturbated, ripple cross bedded and includes

Turbidite sandstone and conglomerate Medium-greenish-gray sandstone; fine- to very coarse grained and granular, mostly fine- to medium-

between 1 to 2 feet (0.3 to 6m) thick and thicker sandstone intervals

are generally composed of amalgamated beds. Beds are massive, grad-

flute casts and tool marks. Sandstone includes much carbonized wood

debris some of which is up to 1 foot (0.3m) long. Most larger sand

grains and granules are chert including light-gray, light-greenish-

TOROK FORMATION (Detterman and others, 1963) (Lower Cretaceous) --

Castle Mountain. The monotonous character, imbrication,

Detterman and others (1963) report 6,120 feet (1865m) of Torok

thickness based on outcrop width and dip unreliable. Shale,

mudstone, siltstone, and sandstone. Mostly bluish-gray, dark-

Formation in the type section along Torok Creek north-northwest of

incompetence, and incomplete exposure of this unit make estimates of

greenish-gray, medium-dark-gray and dark-gray shale, mudstone, and

siltstone and fine-grained sandstone partings and thin interbeds.

Sandstone, medium-light-gray and greenish-gray, very fine to very

of mostly chert, includes some lenses of granule conglomerate.

coarse grained, silty and shaly, conglomeratic in part with granules

Formation includes distinctive iron-stained and granule- to small-

pebble-bearing shale, mudstone, and siltstone (xxx). Some outcrope

give some beds a metallic appearance. Clasts in pebbly beds are

igneous rock. Iron-stained and pebbly units include ironstone

Cretaceous sandstone that occurs in the lower part of the Torok

in a trend that parallels and lies south of the Tuktu Escarpment.

Recognition of the Cobblestone sandstone unit refines previous

map strata herein assigned to the Cobblestone sandstone unit as

Kcs | COBBLESTONE SANDSTONE UNIT (Lower Cretaceous) -- Cobblestone sandstone

and carbonaceous shale.

of pebbly strata are deeply iron-stained with goethite coatings that

scattered, well rounded, percussion-marked and mostly chert and mafic

lenses. Formation includes some thin beds which are tough, fissile,

unit is a new and informal lithostratigraphic name proposed for Lower

Formation. The unit comprises lenticular and discontinuous bodies of

south-dipping imbricate fault blocks. Outcrops occur discontinuously

sandstone and conglomerate that occur in structurally complex and

stratigraphy. Previous workers (Patton and Tailleur, 1964, pl. 50)

Fortress Mountain Formation. Cobblestone sandstone unit discrimin

Mountain Formation that overlie the Torok Formation and structurally

turbidites, that depositionally underlie dark-gray shale in the Torok

Anaktuvuk River includes much nonmarine strata and overlies dark-gray

Fortress Mountain Formation are middle and late Albian (J.W. Miller,

1983, written comm.) and age correlative to fossils in the Nanushuk

Group which overlies the Torok Formation along the Tuktu Escarpment

Map pattern suggests that sandstone bodies of the Cobblestone sand

miles (16 km) in lateral continuity. Structural complexities too

stone unit range up to 1,000 feet (305 m) thick and greater than 10

small to be shown at 1:125,000 and likely to produce repeated section

suggest that the estimated thickness and lateral extent are at least

--Sandstone, siltstone, mudstone, and conglomerate. Mostly yellow-

small-scale and wispy cross bedded in part, includes locally abundant

carbonized small plant debris and carbonaceous films, includes flute

sequences. Sandstone beds are locally organized into thinning upward

cycles consisting of amalgamated sandstone and gritty sandstone pro-

gressively overlain by thinner and fewer amalgamated sandstone beds

interbedded with siltstone and mudstone. Yellowish-brown-weathering

ed, grades to very fine grained sandstone, and includes plant debris.

bedded, very silty in part, very sandy in part, and locally includes sandstone partings. Conglomerate is framework-supported and consists

mostly of well rounded clasts that range from granule to cobble size

but are mostly pebble size; clasts are mostly chert, miscellaneous

silicified aphanitic rock, mafic igneous rock, and carbonate rock.

reddish-brown-weathering beds comprising bivalves, typically Buchia

sublaevis, algae, and shell hash. Typically these beds are broken slabs in association with the Otuk Formation and probably in deposit

like blocks in highly sheared and disrupted Cretaceous and Upper

Jurassic shale and sandstone. The coquinoid limestone occurs in

KJu, CRETACEOUS AND UPPER JURASSIC STRATA UNDIVIDED -- Patton and Tailleur

sh, sd, 1964, p. 447) report between 1,800 (550 m) and possibly 2,200 feet

cgl (670 m) of Berriasian and Valanginian strata in the Cretaceous and

Jurassic strata undivided unit. The total thickness of the

Cretaceous and Jurassic strata undivided unit is unknown due to

structural complexity, generally poor and discontinuous exposure,

lack of reliable marker beds, and poor biostratigraphic control.

(sh), (2) conglomerate (cgl), (3) tuffaceous sandstone, and (4) volcaniclastic breccia. The 4 facies, with the possible exception of

This unit includes at least 4 facies: (1) sandstone (sd) and shale

the conglomerate facies, are probably end members of a continuum of

rock-types. The sandstone and shale facies (u) make up the bulk o

unit and range from shale with subordinate turbidite sandstone to

amalgamated turbidite sandstone with subordinate shale. The sand-

Tailleur (1964). The unit probably includes exposures of Lower

or Fortress Mountain Formation.

mudstone, and shale.

Cretaceous strata that with better exposure and close examination

stone and shale facies includes the Okpikruak Formation of Patton and

would be assigned to the Cobblestone sandstone unit, Torok Formation,

Sandstone and shale Light-olive-gray and greenish-gray sandstone; mostly medium- to fine-grained subangular to subrounded quartz,

matrix. Grain boundaries are typically obscure in more matrix-rich

sandstone. Graded bedding and incomplete turbidite sequences are

common. Wood debris, prod marks, flute casts, and load casts are

aphanitic rock fragments. Includes medium-greenish-gray siltstone,

Conglomerate Framework supported conglomerate that typically occurs as beds and lenses in association with turbidite sandstone; composed

of well rounded to subangular granules and small pebbles of quartz,

chert, and rock fragments. Chert includes greenish-gray, light-gray

and dark-gray varieties. Most rock fragments are greenish-gray to

fill channels cut in sandstone and shale. Isolated bodies of the

greenish-gray and various colored chert, and yellowish-gray-

weathering silicified limestone or mudstone, and organic shale.

Tuffaceous sandstone Grayish-green tuffaceous sandstone; fine- to

includes chloritized rock fragments, includes relict glass shard

textures in thin section. Bedding ranges up to 1 foot (0.3m) thick

and is commonly graded, also massive or obscure. Chlorite develop-

slickensided surfaces. Tuffaceous sandstone is interbedded with

ment and grain obliteration is especially prominent along broken and

greenish-gray to olive-gray to medium-dark-gray siltstone and shale.

Volcaniclastic breccia Grayish-green breccia; mostly granule to pebble size clasts of greenish-gray rock fragments in grayish-green

matrix, includes framework- and matrix-supported breccias. Volcanic

rock fragments are mostly chloritized aphanitic rock fragments but

some fragments include fine-grained plagioclase laths. Few fragments

in the breccias. The matrix is typically a dense felted mass of

greenish-gray, olive-gray, and light-olive-gray mafic igneous rocks;

mostly fine-grained and equigranular, but also aphanitic, porphyri-

tic, and coarse-grained. Porphyritic varieties include plagioclase

laths in a grayish-green groundmass of chloritized mafic minerals,

similar apparent composition. Some are sills, although most are pod-

Undisturbed chilled margins are rare. S. W. Karl (oral comm., 1976)

Bodnar (1984) reports thicknesses of incomplete, and possibly struc-

turally complex sections, ranging from 119 m. (390 ft.) to 18 m. (60

ft.) thick in the Chandler Lake quadrangle. Based on correlation and

thickness of the Otuk formation is about 415 ft. (125m.). The forma-

tion consists of 4 members; shale member, chert member, and limestone

chert, and limestone members are not discriminated in mapping and the

Shale Member Dark-gray, grayish-black, and greenish-gray shale and

tone; silty in part, fissile in part, soft and sooty in part,

tone; typically rhythmically bedded and thin-bedded, laminated

includes thin beds of dark-gray limestone that is locally phosphatic

in part, wispy cross bedded in part, with interbeds and partings of

thick of black, soft, sooty shale. Halobia and Monotis are locally

Limestone Member Rhythmically interbedded yellowish-gray, light-brownish-gray, and tan-weathering dark-gray fine-grained and very

impure limestone; thin-bedded with partings and interbeds of dark-

partings of Monotis and Halobia coquina.

Blankenship Member Dark-gray to black shale; carbonaceous, includes

brownish-gray-weathering pliable paper-like oil shale beds and thin

gray and black shale. Includes very thin bedded intervals and

SHUBLIK FORMATION, (Patton and Tailleur, 1964) (Triassic) -- The

Shublik Formation is probably between 415 and 450 ft. (125m. and

135m.) thick. Biggest exposure of the Shublik Formation is along

upper Cobblestone Creek, but structural complexity precludes accurate

estimation of formation thickness. Shale and impure limestone, most-

ly dark- to very dark gray shale; soft, sooty, fissile in part with

paper-like weathering character in part, locally includes spherical

calcareous in part. Dark-gray limestone; also medium-dark-gray and

shades of gray than associated shale, includes locally abundant thin

shell bivalves including Halobia and Monotis. Unit locally includes

Triassic) -- Shale, limestone, and chert. Dark-gray to very dark-gray

shale; soft, recessive-weathering, sooty in part, fissile in part,

and locally very calcareous. Dark-gray limestone; also brownish

gray, very argillaceous and grades to calcareous shale, very thin

bedded, and locally includes mud Pecten coquina. Yellowish-gray-

comprises much shale and limey shale, but includes yellowish-gray-

ribbon chert bodies as much as 300 feet (90 m) thick in the Chandles

outcrop to outcrop, limit confidence in estimating the thickness of

feet (150 m) thick east of the Anaktuvuk River and appears in general

to thin eastward towards the Cobblestone Creek area. Chert occurs as

green, very light gray, and moderate-yellowish-green to grayish-green

(2.5 to 15cm) thick with most beds between 2 to 2.5 inches (5 to 6cm)

graded, evenly parallel bedded with beds ranging from 1 to 6 inches

thick, radiolarians are locally abundant and especially conspicuous

partings and black-carbonaceous shale partings, locally deeply iron-

stained on weathered surfaces, part of the Triassic cherts grade to

Triassic and Permian chert, the chert appears to be as much as 500

structural blocks that range from hand specimen-size clasts in

depositional thickness of the chert. Medium-light-gray, grayish-

ribbon chert; very finely laminated in part, locally obscurely

in light-greenish-gray chert, locally includes silicious shale

SIKSIKPUK FORMATION (Patton and Tailleur, 1964) (Permian)--Siok (1985,

pl. 7) reports 175 and 145 m. (575 and 475 ft.) of Siksikpuk Forma-

tion in two measured sections along the range front between Confusion

posed in either section but, outcrops of the overlying Otuk Formation

occur near the top of the measured sections, especially close to 145

m (475 ft.) thick section. Three lithofacies occur in the Siksikpuk

Formation. The three lithofacies are end members of a continuum ob-

scured by thrust faulting, especially north-south facies transitions.

occurs east of the Nanushuk River along the range front. Lithofacies

3 occurs near the head of Ekokpuk Creek in the southwestern map area

<u>Lithofacies</u> 1--Mostly mudstone and siltstone with smaller amounts of

shale, and limestone. Variegated mudstone and siltstone; reddish-

gray to black, laminated in part, thin- to medium-bedded, calcareous

weathers reddish-orange, locally pyritic, includes barite veins and

very impure, very shaly and silty, and locally fossiliferous. Black

nodules, carbonate nodules, and includes reddish-orange claystone

partings and thin interbeds. Medium-dark-gray to black limestone;

to dark-gray shale; fissile, includes siltstone and mudstone part-

brown, grayish-red, light- to dark-greenish-gray, and medium-dark-

in part and grades to very silty and shaly limestone. locally

Lithofacies 1 occurs along the range front between the western

boundary of the map area and the Anaktuvuk River. Lithofacies 2

and Firestone Creeks. The top of the Siksikpuk Formation is not ex-

the chert member of the Otuk Formation.

melange to large blocks that probably include the original

discontinuous outcrop, and general lack of stratigraphic control from

weathering chert; grades to silicified limestone and mudstone,

rhythmically bedded, and thin bedded. This unit is transitional between Shublik and Otuk Formations. Where well exposed the unit

and ellipsoidal apatite concretions up to 1.5 inch (38mm) across,

brownish-gray, typically weathers in positive relief and lighter

ferrugenous-weathering shale and mudstone. Unit locally includes

yellowish-gray-weathering silicified beds and grades to Otuk

JTos OTUK and SHUBLIK FORMATIONS UNDIFFERENTIATED (Jurassic(?) and

weathering beds characteristic of the Otuk Formation.

TPc | CHERT (Triassic and Permian) -- Patton and Tailleur (1964, p. 439) report

Lake quadrangle. Although structural complexity, poor and

dark-gray and commonly silty shale, and intervals up to 10 feet (3m)

Chert Member Dark-gray to black chert, and silicified micritic

member, and the Blankenship Member in ascending order. The shale,

projection of the measured sections (Bodnar, 1984, fig. 10), the

like masses in structurally disturbed contact with their host rock.

mostly pyroxene. Some varieties have diabase texture. Some are

amygdaloidal and vesicular. Some are autoclastic, consisting of

fine-grained to aphanitic clasts in a crystalline groundmass of

reports observing pillow structures on Tiglukpuk Creek.

Jto OTUK FORMATION (Mull and others, 1982) (Lower Jurassic and Triassic) --

Blankenship Member is not widely recognized.

and dark-gray to black chert.

MAFIC IGNEOUS ROCKS (Patton and Tailleur, 1964) (Jurassic) -- Dark-

are vesicular and amygdaloidal. Scattered chert clasts occur locally

coarse-grained, most grain boundaries are indistinct, very chloritic

dark-gray, aphanitic, and silicified. Framework-supported conglomer-

ate also typically occurs in isolated bodies, some of which appear to

heterolithic conglomerate include subrounded to subangular pebbles of

common. Conglomeratic in part with granules of mainly chert and

feldspar, chert, and greenish-gray rock fragments in a chloritic

tional contact with the Blankenship Member of the Otuk Formation in

the Ekokpuk Creek area. The coquinoid limestone also occurs as slab-

presumable deposition relations with Otuk Formation on upper Ekokpuk

COQUINOID LIMESTONE (Lower Cretaceous-Valanginian) -- Brownish-gray and

olive - to greenish-gray siltstone; is mostly thin-bedded to laminat

Medium-dark-gray to medium-greenish-gray mudstone; mostly thin-

marks, load casts, and tool marks. Sandstone comprises moderately sorted subangular to subrounded clasts of chert, quartz and rock

fragments. Sandstone occurs in typically incomplete turbidite

ish-brown-weathering olive- to greenish-gray coarse- to very fine

grained sandstone; very thin to massive-bedded, laminated in part,

ates exclusively marine strata that occurs in the lower part of the

Torok Formation from nonmarine and marine strata of the Fortress

complex rocks exclusive of the Torok Formation. The Cobblestone

sandstone unit comprises submarine gravity flow deposits, mostly

Formation. In contrast, Fortress Mountain Formation at the type

shale of the Torok Formation. Fossils in the upper part of the

section (Patton and Tailleur, 1964) and other outcrops west of the

clayey siltstone; fissile in part, mostly very thin bedded, includes

interbedded with siltstone and silty mudstone.

gray, dark-gray, and very light gray tripolitic chert. Sandstone is

ed, laminated, and locally wispy cross bedded. Sole marks include

grained with very coarse grained sandy to granule conglomerate.

Sandstone beds are up to 5 feet (1.5m) thick, but most beds are

This is a preliminary compilation of geologic mapping in the Chandler Lake

Lake quadrangle are for the purpose of making a hydrocarbon and mineral

however, will not be available in time to contribute to an oil and gas

quadrangle. Recently completed geologic field investigations in the Chandler

resource assessment of the quadrangle as part of the Alaskan Mineral Resource

Assessment Program (AMRAP). An AMRAP folio for the Chandler Lake quadrangle,

This map is an interim product to provide new information for an oil and gas

assessment of the Central Arctic Management Area (CAMA) required by Section

1980. ANILCA requires oil and gas assessment of all Federal lands lying north

1001 of the Alaska National Interest Lands Conservation Act (ANILCA) of

of 68° N latitude exclusive of the National Petroleum Reserve-Alaska, the

Arctic National Wildlife Refuge, and submerged land on the Outer Continental

The principal emphasis of this map is to provide a basis for determining the

showing the distribution of major rock types is available for most of the

scattered parts of the quadrangle prior to the present study. Structural

framework is imperative to an oil and gas assessment, especially so in a fold

quadrangle but, detailed mapping is only available for small and widely

The map incorporates new mapping and interpreted published mapping. New

generalized to 1:125,000 along the eastern boundary of the quadrangle. The

transect provides an understanding of structural style in the quadrangle and a

basis for incorporating published geologic mapping at varying scales, with and

without topographic bases, and differing detail and opinion, into a coherent

geologic map. Map construction outside the transect relies heavily on air-

Scattered geological observations from spot checks, helicopter overflights

and foot traverses are part of the map compilation outside of the transect.

Two portions of the geologic map show structural and stratigraphic relations

simple structural patterns underlying most of the area north of the escarpment

photo interpretation to integrate the different sources of information.

whereas an intervening part of the map is largely an outcrop map. Near-

continuous outcrop south of the range front affords construction of a map

showing distribution of structures and map units. Regional continuity and

and Table Mountain affords construction of a map showing structural and

stratigraphic relations north of the escarpment. Limited outcrop and

inspection to a topographic base at 1:125,000.

coalified wood debris.

descriptions of Quaternary deposits

including Hatbox Mountain, Tuktu Bluff, Gunsight Mountain, Banded Mountain,

structural complexity severely limit mapping between the escarpment and the

units. Mapping between the escarpment and the range front is from field

observations annotated on air-photographs at 1:120,000 and transferred by

range front; mapping in this area is mostly the outcrop distribution of rock

Qal QUATERNARY ALLUVIUM (Hamilton, T.D., 1979) (Holocene) -- Unconsolidated

QUATERNARY DEPOSITS (Hamilton, T.D., 1979) (Quaternary) --

Ksb | SCHRADER BLUFF FORMATION (Detterman and others, 1963) (Upper

debris including boulders, gravel, sand, silt, clay and humic

bogs and swamps. See Hamilton (1979) for detailed map and

material. Primarily sediments in river channels, active floodplains,

Undifferentiated unconsolidated deposits, including glacial drift,

clay. See Hamilton (1979) for detailed map and descriptions of

outwash, and high-level terraces: boulders, gravel, sand, silt and

Cretaceous) -- Three members make up the Schrader Bluff Formation, in

Members. All three members occur in the Chandler Lake quadrangle but

are not discriminated. Detterman and others (1963) report about 1800

Shale, claystone, sandstone, and bentonite. Medium- to light-gray

bentonitic shale, clayey, fissile, and includes tuff beds. Medium-

part. Light-gray to light-brown sandstone: fine-grained. laminated.

and micaceous. Medium to light-grayish-green bentonite beds. Gray

PRINCE CREEK FORMATION (Detterman and others, 1963) (Upper Cretaceous) --

Only the Tuluvak Tongue of the Prince Creek Formation is recognized

in the Chandler Lake quadrangle. Detterman and others (1963) report

Tongue appears to thicken radically because outcrop widths and dips

approaching 2,000 feet (610 m). The character of the Prince Creek

Northeast Sandstone, siltstone, mudstone, coal, and tuff. Medium- to

medium-gray, yellowish-gray, and brownish-gray sandstone; thin-

in the northeastern Chandler Lake quadrangle suggest thicknesses

to medium-bedded, fine-to coarse-grained, locally conglomeratic,

tuffaceous in part, includes conglomerate composed mostly of small

pebbles of black chert and white quartz and quartzite. Mudstone,

siltstone, and shale; medium-gray to dark-gray, fissile in part,

Southwest Conglomerate, sandstone, siltstone, and shale. Basal

to dark-gray chert. Conglomerate has a sandstone matrix and

SEABEE FORMATION (Detterman and others, 1963) (Upper Cretaceous) --

and others (1963) report about 1,800 feet (550 m) of Shale Wall

Member along the Nanushuk River at Rooftop Ridge. Detterman and

others (1963) also report 360 feet (110 m) of Ayiyak Member in the

thickness distribution. Outcrop widths and dips suggest that the

Seabee Formation is about 1,400 feet (425 m) thick and probably thins

Differences in reported thickness probably are related to structural

type locality along the Ayiyak River and a generally persistent

to the south, probably at the expense of the Shale Wall Member.

complications in the tuffaceous and shaly Shale Wall Member.

Shale Wall Member Medium-gray shale; bentonitic, clayey, with bentonite beds, laminated siltstone interbeds, and limestone

concretions. Includes dark-gray to black organic shale locally,

clayey limestone concretions up to 8 feet (2.4 meters) across. and marine fossils. Also locally includes medium to medium-light-gray

fine- to very fine grained sandstone with interbeds of siltstone.

Ayiyak Member Greenish-gray and olive-gray siltstone; typically

haly, and grades to mudstone. Brownish-gray and greenish-gray

impure limestone, calcareous concretions, shale, and ironstone

is principally nonmarine sandstone that interfingers with the

Tongue. The Ninuluk Formation comprises strata deposited in

NIAKOGON TONGUE OF THE CHANDLER FORMATION, AND NINULUK FORMATION

sandstone; thin- to medium-bedded, mostly fine-grained but locally

coarse-grained and conglomeratic. Includes thin lenticular beds of

(Detterman and others, 1963) (Upper-Cretaceous) -- The Niakogan Tongue

laterally equivalent and principally marine sandstone of the Ninuluk

progressively deeper water to the northeast. Detterman and others

1,160 feet (355 m) is a maximum value for the Niakogon Tongue and

Ninuluk Formation; both units are locally absent either by erosion

along an unconformity at the base of the Seabee Formation or abrupt

Niakogon Tongue Sandstone, siltstone, and mudstone. Light-olive-gray, greenish-gray, and medium-gray sandstone; light-gray-weathering

with a "salt and pepper" appearance, also locally buff and yellowish-

locally, includes ironstone concretions locally, and includes beds of

red weathering and strongly iron-oxide-stained, fine- to coarse-

quartz. Siltstone and mudstone make up to half of the tongue.

grained, thin-bedded to massive, well indurated, limonite cemented

granule conglomerate and conglomeratic sandstone. Granules in con-

Plastic grayish-green bentonite beds occur in the upper part of the

glomerate and conglomeratic sandstone are mostly dark-gray chert and

Ninuluk Formation Sandstone, siltstone, and shale. Greenish-gray to

prownish-gray sandstone; thin-bedded to massive, laminated in part,

grained and grades to siltstone, conglomeratic in part and includes

beds and lenses of granule conglomerate comprising varicolored chert

grading to sandy and silty limestone. Sandstone beds become progres-

carbonate cemented in a northeasterly direction. Greenish-gray shaly

sively finer grained, thinner bedded, more clayey and more commonly

Formation includes soft shale with weathered surfaces that commonly

Patton and Tailleur, 1964) (Lower Cretaceous) -- Detterman and others

outcrop widths and dips suggest that the Killik tongue is about 2.600

feet (790 m) thick but thins dramatically to the northeast, possibly

Formation or possibly by facies transition into marine map units.

Sandstone, conglomerate, siltstone, shale, and coal. Light-olive

gray, greenish-gray, and medium-gray sandstone and conglomerate:

weathers light-gray with "salt and pepper" color patterns caused by

light gray weathering quartz, feldspar, and light-gray chert grains;

sandstone and conglomerate beds comprise clasts of mostly chert and

feet (3 m) thick occur in the upper part of the tongue and together

with siltstone and shale are negative weathering and generally poorly exposed. Ironstone concretions are common in the coal-bearing part

of the tongue. Sandstone and conglomerate are very prominent ledge-

Patton and Tailleur, 1964) (Lower Cretaceous) -- Tuktu and Grandstand

basal sandstone is time-transgressive to the north: the age of the

Grandstand Formation is equivalent to that of the Killik tongue of

Formations constitute the basal sandstone of the Nanushuk Group. The

the Chandler Formation, which overlies the Tuktu Formation. The two

formations are mapped as an undivided unit here although the Grand-

formations occupy the same stratigraphic position at the base of the

Nanushuk Group, (2) the units are chronologic end members of a time-

detachment occurs between the Tuktu/Grandstand Formations and under-

Detterman and others (1963) report thickness of Tuktu Formation from

measured sections to range from 940 to 1,030 feet (285 to 315 m).

and dips suggest that the Tuktu/Grandstand Formation attains

Cretaceous) -- This unit includes 2 lithofacies: (1) nonmarine

Kf(t) FORTRESS MOUNTAIN FORMATION, (Patton and Tailleur, 1964) (Lower

Detterman and others (1963) report 1,430 feet (435 m) of Grandstand

Formation at the type section on the Anaktuvuk River. Outcrop widths

thicknesses up to 1,500 feet (455 m). Grayish-green to greenish-gray

sandstone; medium - to very fine grained, shaly in part, cross bedded

in part, includes ripple marks locally, wood debris, marine fossils,

and mudstone makes up a small part of the formations. The formations

few conglomerate beds, and bioturbations. Greenish-gray siltstone

are resistant weathering and together with the overlying nonmarine

conglomerate and associated marine sandstone (Kf) which occurs west

of the Anaktuvuk River, and (2) turbidite sandstone and conglomerate

(Kft) east of the Anaktuvuk River. Patton and Tailleur (1964) report

between 2,500 and 10,000 feet (760 and 3050 m) of Fortress Mountain

attitudes suggest that the Fortress Mountain Formation, as used in

this map and west of the Anaktuvuk River, is probably between 700 and

Mountain area and thins to the east. Sandstone and conglomerate east

of the Anaktuvuk River is possibly about 1,000 feet (305 m) thick;

structural complexity, however, greatly limits confidence in this

Fortress Mountain Formation in this map differs from previous recon-

naissance mapping in the Chandler Lake quadrangle. Previous workers

Formation is unlikely as young as middle Albian or equivalent to the

Nanushuk Group. Other workers (Detterman and others, 1963, p. 230;

Chapman and others, 1964; Gryc, 1956; Patton, 1956; Jones and Gryc,

1960, p. 151; Molenaar, 1981, p. 26; Molenaar and others, 1981, p. 3;

Mull, 1979, p. 5; and Ahlbrandt and others, 1979, p. 14) describe the

Fortress Mountain Formation as laterally equivalent to or below the

sandstone and conglomerate that overlie the Torok Formation at least

West of the Anaktuvuk River, the Fortress Mountain Formation compris-

es much nonmarine strata that occur in unimbricate shallow-dipping

slab-like structural blocks that lie on complexly imbricated blocks

of Mississippian to Lower Cretaceous strata, melange, and locally

Torok Formation. Outcrops are mostly massive-weathering nonmarine

Most outcrops are erosional remnants of broad basin-shaped synclines

comprising ridges underlain by beds of erosion-resistant conglomerate

fault superimposed along a pre-existing unconformity, with underlying

conglomerate and sandstone but include locally marine sandstone.

and sandstone arranged in a circular or ellipsoidal pattern and

dipping toward a central point. The outcrops are remnants of more

extensive structural sheets in probable fault contact, possibly a

older rocks including graywacke, ribbon chert, mafic igneous rocks

and melange. Outcrops of Torok Formation occur below the Fortress

Mountain Formation on the north flank of Fortress Mountain and east

lesser degree sandstone, depositionally consanguious with the Fort

older underlying graywacke and mudstone is operationally mapped as

to late Albian (J.W. Miller, writen comm., 1983) and equivalent to

ever, formation assignments of strata containing pre-Albian fossils

the lower part of the Nanushuk Group and Torok Formation. The

Fortress Mountain may also include fossils as old as Barremian;

East of the Anaktuvuk River, the Fortress Mountain Formation con-

the Anaktuvuk River. Outcrops east of the Anaktuvuk River occur

trasts in some respects to the Fortress Mountain Formation west of

gravity flow deposits rather than interbedded nonmarine and marine

deposits as west of the river. Torok Formation is not recognized

May Creeks although Torok Formation lies adjacent to the Fortress

Creeks, the Fortress Mountain formation occurs in imbricate south-

of the Anaktuvuk River; on both sides of the Anaktuvuk River, how-

dipping slab-like blocks in contrast to the unimbricate blocks west

beneath the Fortress Mountain Formation along upper Cobblestone and

Mountain Formation along May Creek. Along upper Cobblestone and May

along upper Cobblestone and May Creeks where the strata are submarine

ress Mountain Formation but structurally detached and intermixed with

KJsh or KJu. Fossils from marine sandstone interbeds within predomi-

nately nonmarine strata in the Fortress Mountain Formation are middle

of Fortress Mountain in T.10S., R.2W., U.M. Mudstone, and to a

Torok Formation, which underlies the Nanushuk Group. In this map,

the term Fortress Mountain Formation applies to Lower Cretaceous

(Patton and Tailleur, 1964, p. 458) consider the stratigraphic

relations between the Fortress Mountain and Torok Formations and

Nanushuk Group uncertain, but state that the Fortress Mountain

Formation at Fortress and Castle Mountains. Outcrop widths and

lying shale; the single map unit helps demonstrate the structural

discontinuity and stratigraphic continuity.

sandstone form prominent ridges.

transgressive depositional unit, and (3) a widespread structural

stand Formation is younger than the Tuktu Formation because: (1) both

TUKTU FORMATION AND GRANDSTAND FORMATION (Detterman and others, 1963;

dark gray chert and aphanitic rock fragments in contrast to very

medium-grained to fine-grained, and cross bedded. Conglomeratic

quartz. Conglomerate is framework supported. Coal beds up to 10

(1963) report thicknesses of 2,570 and 2,840 feet (785 and 865 m)

from measured sections in the Chandler Lake quadrangle where the

Killik tongue is not interfingered with other map units. Mapped

by truncation under an unconformity at the base of the Seabee

have yellowish-gray or light-gray bloom. Siltstone and shale include

siltstone and dark-bluish-gray clay shale; siltstone is hard and

ironstone concretions. Grayish-green plastic claystone, probably

hackly weathering and both siltstone and shale are laminated.

Kck | KILLIK TONGUE OF THE CHANDLER FORMATION (Detterman and others, 1963;

bentonite, occurs in shale.

forming strata.

cross-bedded, friable to moderately indurated, fine- to very fine

and white quartz. Sandstone includes ripple marks, carbonaceous

debris, marine fossils, and thoroughly carbonate-cemented lenses

1963) report 1,160 feet (355 m) of Ninuluk Formation on the east

fork of the upper Tuluga River. Outcrop widths and dips suggest that

Formation. The Ninuluk Formation crops out northeast of the Niakogon

conglomerate composed mostly of black chert and white quartz pebbles,

onglomerate up to 40 feet (10 m) thick composed of well rounded

pebbles of white to light-gray quartz and orthoquartzite and medium-

prominent quartz cement that reflects light. Conglomerate produces

Includes the Shale Wall Member and overlying Ayiyak Member. Detterman

prominent positive weathering topographic features such as cuestas

and rimrock. Sandstone in upper part of the unit is prominently

bentonitic in part. Includes plant fragments, tuff beds, coal, and

Formation changes from southwest to northeast.

cross bedded and very poorly exposed.

Member is calcareous cemented in part.

gray claystone; commonly well indurated, probably tuffaceous in

tuffaceous siltstone. Formation includes shell fragments and

ascending order, the Rogers Creek, Barrow Trail, and Sentinel Hill

feet (550 m) of Schrader Bluff Formation at Race Track Basin

mapping includes a transect of unpublished 1:63,360 geologic mapping

and thrust belt where source, trap, reservoir, seal, and timing are

interrelated to a great degree through structural geology.

structural framework of the Chandler Lake quadrangle. Reconnaissance mapping

fracturing but blockly weathering, partly rhythmically bedded and gray to black, soft, sooty in part, and poorly exposed. Barite

strata up to 50 feet (15 m) thick occur in imbricate fault blocks composed mostly of Lisburne Group carbonate strata east and adjacent to the head of the Nanushuk River. Siltstone, sandstone, and mudstone. Reddish-brown siltstone and mudstone; iron-oxide cemented and deeply iron-stained on weathered surfaces, also greenish-gray varieties without much iron-stain. Sandstone is very fine to finegrained, ripple-scale cross bedded, and grades to siltstone. Includes coquina of brachiopods, bryozoans, and shell debris. Large Zoophycos are prominent. Only the basal part of the rock unit is

Dutro, 1957; Armstrong and Mamet, 1977 and 1978) (Mississippian)-Mostly light-brownish-gray packstones and wackestones composed of bioclastic framework clasts and interstitial lime mud; abundantly fossiliferous including brachiopods, foraminifera, echinoderas, corals, bryozoans, and gastropods. In most places, the clastic character of the limestone is apparent, but dolomitization obscures the grain fabric locally. Bedding ranges from thin to massive and locally includes cross bedding and cross lamination. Dark-gray shale, carbonaceous limestone, shaly limestone, and limy shale occur nodularform beds. Ferruginous-weathering and especially fossiliferous beds occur near the base of the Wachsmuth Limestone The Alanah and Wachsmuth Limestones are about 3.340 feet (1018 m.) thick (Bowsher and Dutro, 1957; Armstrong and Mamet, 1977; and Armstrong and Mamet, 1978) in aggregate throughout the quadrangle except in the Ekokpuk Creek area, southwest of confluence of Ekokpuk Creek and the John River, and between the John River and upper rather than thousands of feet thick. The Alapah and Wachsmuth Limestones of the Lisburne Group include two

are identified but not assigned to the Kuna Formation. Mish SHALE FACIES OF THE ALAPAH LIMESTONE (Mississippian) -- Very dark gray to medium-dark-gray argillaceous limestone, limy shale, and nodular-form chert. Includes locally abundant phosphatic nodules and/or ooids. Most of the limestone and limy shale is fine-grained, carbonaceous, thin bedded to laminated, locally platy weathering. Carbonaceous shale partings occur locally. Some outcrops have a sooty carbonaceous bloom on weathered surfaces. The facies grades to medium-gray bioclastic limestone and dolomitized limestone. Mull and others (1982) suggest that the shale facies in this map is likely the easternmost tongue of the black chert and shale facies of the Kuna

The shale facies are not herein assigned to the Kuna Formation because they lack lateral persistence, consistent stratigraphic position, and unique lithology. At least locally, two intervals, herein as shaly facies (Mlsh) occur; the upper interval is transitional to the Siksikpuk formation and the lower interval is previously identified as the black chert and shale member of the Mapah Limestone (Patton and Tailleur, 1964, p. 419). Neither which is locally phosphate-bearing, does not have a locally

conchoidal fracture, highly fractured, many white quartz vienlets, includes locally abundant medium-light-gray dolomitized micrite in argillaceous siltstone and medium-gray limestone, includes faint Alapah and Wachmuth Limestones undifferentiated.

between these strata and most of the strata assigned to the Kuna Formation. Prominent bedding, ranging from rhythmic to uneven, characterizes the Kuna Formation, whereas the chert facies along Lake Quadrangle is platform carbonate strata.

line but grades to medium-grained crystalline limestone, relict thinbedding locally present, friable weathering, highly fractured, rubbly outcrops, some parts of the unit consist of friable-weathering mixtures of large single crystal calcite grains in a recrystallized finer-grained matrix-possibly recrystallized encrinite limestone. This unit may be part of the Nuka Formation of Mississippian age. Outcrops of marble occur adjacent to Natvakruak and Tiglukpuk Creeks in the 11 S. township tier.

igneous rocks, Cretaceous and Jurassic sandstone, coquinoid limestone, and probably marble in a thoroughly sheared and disrupted matrix of greenish-gray and olive-gray shale and mudstone. The matrix and sandstone blocks are indistinguishable from broken formation consisting of strata elsewhere assigned to Cretaceous and Upper Jurassic strata (KJu).

MDKs STUVER MEMBER of the KANAYUT CONGLOMERATE (Bowsher and Dutro, 1957: Nilsen and Moore, 1984, Nilsen and others, 1980; Nilsen and others, 1981; Nilsen and Moore, 1982; and Porter, 1966) (Mississippian(?) and Upper Devonian)--Nilsen and Moore (1984, p. A60) report thicknesses from three measured sections in the Chandler Lake quadrangle; 217m (710 ft.) in the Shainin Lake area, 215m (705 ft.) near Chandler Lake, and 165m (540 ft.) west of the John River. They further report that the Stuver Member is generally thin along the northern margin of the mountains and thickens eastward into the adjacent Philip Smith quadrangle. Mapping indicates that the Stuver Member changes facies to the south and southwest and the resulting map unit, which includes the underlying Shainin Lake Member, is about 1,000 ft. (305 m) thich in the southeastern part of the quadrangle. Sandstone, siltstone, conglomerate and shale. Variously iron-stained sandstone; ranges from very fine grained to very coarse grained and conglomeratic, ranges from orthoquartzite to quartz-rich sandstone, consists of very light gray quartz, chert, and siliceous rock fragments. Sandstone peds range up to about 3 feet (1 m.) thick and typically occur as elements of fining upward cycles. Cross bedding is common in the sandstone. The Stuver member includes conglomerate consisting of granules and small pebbles of chert, quartz, and siliceous rocks typically in a matrix of quartz sandstone. Dark-gray to grayishblack shale and argillaceous siltstone; micaceous, very silty, sandy, and grades to silty sandstone. Most of the strata in the member are iron-stained to varying degrees. The Stuver Member contains Devonian and Early Mississippian(?) plant fossils. The Stuver Member locally includes at its top an unnamed Mississippian(?) grayish-black to dark-gray shale indicated by pattern on the map. The Mississippian(?) shale is carbonaceous, includes plant debris, local ironstones and partings of siltstone and very fine grained quartzose sandstone. Dark-gray, commonly carbonaceous, and shaly quartz sandstone beds occur as positive-weathering tabular bodies in the Mississippian(?) shale. The Mississippian(?) shale unit crops out along the belt of Stuver Member extending from NW 1/4 T.15S., R.7E. west across the Nanushuk River and the head of Alapah Creek to the

Dks | SHAININ LAKE MEMBER of the KANAYUT CONGLOMERATE (Nilsen and Moore. 1984; Nilsen and others, 1980; Nilsen and others, 1981; Nilsen, 1981; Nilsen and Moore, 1982) (Upper Devonian) -- Nilsen and Moore (1984, p. A49) report thicknesses from two complete measured sections in the Chandler Lake quadrangle, 526m (1,725 ft.) near Shainin Lake and 400m (1,300 ft.) on the John River. Furthermore, they report that the Shainin Lake Member thins to the east, west, and south. Mapping further suggests that the Shainin Lake Member thins and probably wedges out to the northeast. Maximum thickness from map information is about 1,800 ft. (550 m). The Shainin Lake Member changes facies to the south which is between 1,000 and 2,200 ft. (305 and 670 m) thick; facies transition takes place at least in part by wedge-out of the Shainin Lake Member. At least locally, southward thinning in the Shainin Lake Member is abrupt (Kelley, 1984b). Conglomerate and sandstone. Conglomerate makes up to half of the Shainin Lake Member. The conglomerate is principally framework-supported and comprises generally well rounded pebbles and cobbles of mostly chert, quartz and quartzite. Matrix of the conglomerate consists of quartz- and chert-rich sandstone and granules. The conglomerate occurs in hard and resistant intervals up to 15 feet (4.5 m) thick. Conglomerate is typically silica-cemented although calcareous and iron-oxide cements are present. Sandstone is hard, resistant, cemented to varying degrees with silica, carbonate, and iron-oxide, and composed of moderately to poorly sorted quartz, chert, and silicified rock fragments. Sandstone beds are commonly cross bedded. The sandstone is moderately to poorly sorted, conglomeratic in part, and includes pebble trains. Much of the conglomerate and sandstone is organized into recognizable fining upward sequences. The Shainin Lake Member includes reddish-brown, greenish-gray, and dark-gray to grayishblack, silty, sandy shale, siltstone, and argillaceous sandstone in varying amounts. The positive-weathering Shainin Lake Member of the Kanayut Conglomerate contrasts sharply with the relatively recessive weathering overlying and underlying members of the Kanayut Conglomerate. The alternating recessive and resistive weathering character of the shale and sandstone making up members of the Kanayut Conglomerate overlying and underlying the Shainin Lake Member contrasts with the massive-weathering character of the Shainin Lake

Kanayut River. Other outcrops occur in S 1/2 T.13S., R.6E. between

Erratic Creek and the Nanushuk River and T.15S., R.7E.

MDku UPPER PART of the KANAYUT CONGLOMERATE (Mississippian? and Devonian) --Based on map information, the upper part of the Kanayut Conglomerate probably ranges from 1,000 ft. to 2,200 ft. (305 to 670 m) thick. Sandstone, conglomerate, and shale. Light-brownish-gray, reddishbrown, and light-olive-gray sandstone; ironstained to varying degrees, cross bedded, very fine grained to very coarse grained, mostly coarse-grained, granular conglomeratic in part, composed mostly of chert, quartz, and silicic rock fragments. Conglomerate is framework supported and consists of mostly granules and small pebbles of chert, quartz, and siliceous rock fragments. Sandstone and conglomerate organized into fining upward sequences. Shale is darkgray, carbonaceous locally, very silty, sandy, and iron-stained in part. The upper part of the Kanayut Conglomerate is characterized l iron-stained outcrops of differentially weathering sandstoneconglomerate intervals and shaly intervals. One or more massive weathering intervals consisting of amalgamated sandstone and

1981; Nilsen, 1981; and Nilsen and Moore, 1982 (Upper Devonian) --Nilsen and Moore (1984, p. A33 and A34) report 510m (1,673 ft.) at Ear Peak, 120m (395 ft.) near the John River and 260m (855 ft.) near Mount MacVicar. Map information suggests that the Ear Peak Member and Noatak Sandstone undifferentiated may be up to 2,500 ft. (760 m) thick. Outcrop width and dips suggest that the Ear Peak member of the Kanayut Conglomerate and the Noatak Sandstone thin abruptly to Ear Peak Member Shale, mudstone, sandstone, and conglomerate. Shale is reddish-brown, grayish-green, brownish-gray, and grayish-black, typically very silty and micaceous and grades to siltstone. Sandstone is quartz-rich and includes orthoguartzites and quartz sandstones with varying amounts of silica, carbonate, and iron-oxide cements. Sandstones are granule to pebble conglomeratic in part and grade to conglomerate. Cross bedding is common in sandstone beds. cross bedding ranges from large scale to ripple laminae. Conglomerate is framework-supported with framework clasts consisting of granules, pebbles, and cobbles of quartz and chert. Sandstone consisting of principally quartz and chert make up the matrix in the conglomerates. The principal rock types of the Ear Peak Member typically are organized into fining upward cycles with conglomerate or massive sandstone at the base grading upward to finer-grained and

ings, and sooty in part. Includes medium-dark-gray to black and greenish-gray to dark-greenish gray siliceous mudstone; wispy Lithofacies 2--Mostly shale and mudstone with smaller amounts of very impure limestone. Medium-gray to black and dark-greenish-gray shale and mudstone; fissile in part, silty in part, calcareous in part, includes fissile dark-gray to black shale that is commonly soft, includes sooty to silty mudstone in which bedding is obscure, includes prominent barite nodules with radiating crystal structure and barite veins. Limestone makes up a very small part of the section; very impure, mostly shaly, and occurs in thin nodularform beds and concretions. Some of the limestone beds are ferrugenous weathering. Siok (1985) reports Zoophycos on bedding surfaces near the base of

Lithofacies 3--Siltstone and shale. Light-gray siltstone, also dark-to very dark gray, and some brownish-gray, hard siliceous, very uniform texture but with faint color laminations in part, conchoidal thin- to medium-bedded, includes porcellaneous chert. Shale is darkconcretions and vienlets up to three inches in greatest dimension are

SADLEROCHIT GROUP (Permian) -- Slab-like bodies of Sadlerochit Group

separated by up to 400 feet (120 m) of Alapah Limestone, identified interval is persistent in thickness or extent. The lower interval, persistent stratigraphic position probably due to intertonguing of Patton and Tailleur (1964, p. 420, fig. 71) both measure sections along Skimo Creek, but only Patton and Tailleur (1964) report a black chert and shale interval within the resistant limestone of the Alapah

Mich CHERT FACIES OF ALAPAH AND WACHSMUTH LIMESTONES (Mississippian) -- Very dark gray to black chert; dense, nearly opaque, mostly massive, oblate ellipsoidal lenses, includes layers of dark to very dark gray wispy structures which may be relict bedding. It is a replacement of

Mk KAYAK SHALE (Bowsher and Dutro, 1957; and Nilsen and Moore, 1984) (Mississippian) -- Predominately shale with interbedded bioclastic limestone and finely crystalline limestone. Dark-gray to grayishblack shale; carbonaceous, generally micaceous and fissile, clayey to very silty, and soft to brittle. Shale is negative weathering in comparison to nonshale interbeds and overlying and underlying formations. Shale grades to mudstone and siltstone and includes thin quartz-rich and commonly bioturbated sandstone beds near the base of the formation. Bioclastic limestone beds are generally less than ft. (2 m.) thick and composed of reddish- and yellowish-brownweathering accumulations of megafossil hash including abundant crinoid parts together with smaller amounts of brachiopod, bryozoan, and coral debris. Argillaceous limestone consists of fine-grained crystalline limestone that is dark-gray to grayish-black, carbonaceous, and generally positive weathering. Reiser and others (1979) report beds of andesitic tuff and volcanic conglomerate in the Kayak Shale at the head of Inukpasugruk Creek. The formation is between about 270 and 870 feet (82-265 m.) thick. Where the formation is best exposed and least disturbed, it is about 560 feet (171 m.) thick.

cross bedded strata. At a distance, the recessive-weathering charac-

M1 ALAPAH and WACHSMUTH LIMESTONES of the LISBURNE GROUP (Bowsher and locally. Dark-gray to light-medium-gray chert occurs as nodules and Inukpasugruk Creek where the Lisburne Group is hundreds of feet thick

facies suggested (Mull and others, 1982) to be part of the Kuna

Formation. Both facies, a shale (Mlsh) and a chert facies (Mlch),

The chert facies is not assigned herein to the Kuna Formation, because of contrasts in bedding characteristics and likely protolith Ekokpuk Creek are massive. Protolith in replacement chert in much of the Kuna Formation is fine-grained clastic strata, possibly mudstone turbidites, whereas protolith in the chert facies in the Chandler

Regional facies changes suggest that the chert facies in the Chandler Lake quadrangle are part of a regional transition from shelf carbonate on the northeast to chert and possibly to Kuna Formation on the southeast. The transition takes place across a linear zone that extends southeast from the range front in the Outwash Creek area west of the Chandler Lake quadrangle, through the Ekokpuk Creek area, and thence south of Doonerak Mountain, south of the Chandler Lake quad rangle. Northeast of the transition zone the Lisburne Group is replacement of platform carbonate in the Outwash Creek area and the kokpuk Creek area. Bedded chert occurs on upper Otuk Creek, west of the Outwash Creek-rangefront area and southwest of the southeasttrending transition zone and could be the facies that lay southwest of the chert facies in the Chandler Lake quadrangle.

Mn NUKA FORMATION (Mississippian) -- Sandstone and limestone. Light-gray to yellowish-gray sandscone; fine- to very coarse grained, mostly coarse- to very coarse grained, mostly subangular quartz and feldspar grains, most feldspar appears to be microcline, glauconite is locally abundant. Light- to light-medium-gray limestone; very coarse grained to fine-grained, composed mostly of crinoid debris, includes some micrite, thin bedded, and cross bedded. Outcrops are small, poor and typically rubbly. The outcrops occur near the confluence of Fortress Creek and Ayiyak Creek, north of Fortress Mountain. Thickness is

mrbl MARBLE -- Marble, light-gray to light-yellowish-gray, coarsely crystal-

mlg MELANGE -- Includes blocks of Triassic and Permian ribbon chert, mafic

conglomerate are present, but generally less than 200 feet (60m) thick and probably discontinuous.

Dken EAR PEAK MEMBER of the KANAYUT CONGLOMERATE and NOATAK SANDSTONE

(Nilsen and Moore, 1984; Nilsen and others, 1980; Nilsen and others,

ter of the Ear Peak Member relative to the overlying Shainin Lake Member of the Kanayut Conglomerate together with the greater degree of differential weathering between sandstone and conglomerate beds and shale beds within the Ear Peak Member help distinguish the Ear

Peak Member from the Shainin Lake Member of the Kanayut Conglomerate Rock types in the Ear Peak Member vary across the map area. Sandstone is most abundant in the north and east parts of the outcrop area mostly north of the Toyuk Mountain thrust. Dark-gray shale is more abundant south of the Toyuk Mountain thrust fault than north of Noatak Sandstone (Upper Devonian) (indicated by pattern on map) -andstone and mudstone. Pinkish-gray, light-brownish-gray, lightgray calcareous -cemented sandstone; fine - to coarse -grained with scattered occurrences of granules and small pebbles of quartz and chert. Sandstone is laminated in part, ranges from thin- to thickbedded, cross-bedded in part, locally includes load casts, marine fossils and scattered plant debris. Dark-gray and brownish-gray mudstone. Principal distinguishing characteristics of the Noatak Sandstone include: pinkish-gray weathering outcrops, continuous and tabular-weathering beds, moderate or good sorting, and carbonate

The Noatak Sandstone changes character across the map area. In the Mount Thibodeaux area, the Noatak Sandstone is much iron-stained, granular conglomeratic with granules of quartz, chert, and ironstone includes conglomerate beds and lenses, deeply iron-stained shale partings, prominent cross bedding, possible rain drop structures. possible paleosols, and marine fossils in deeply iron-stained lenses. The occurence of conglomerate, conglomeratic sandstone, and amount of sandstone in the formation and indication of nonmarine sedimentation decreases south and west of the Mount Thibodeaux area. The Noatak Sandstone discontinuously occurs in the map area. The Noatak Sandstone probably interfingers with the Hunk Fork Shale locally but, structural detachment and thrusting greatly obscure the interfinger-

KANAYUT CONGLOMERATE and NOATAK SANDSTONE (Nilsen and Moore, 1984; and Brosge and others, 1979) (Upper Devonian) -- The thickness of this map unit is very poorly constrained but likely around 2,500 ft. (760 m). Sandstone, shale, and conglomerate. Reddish-brown-weathering reddish-brown to brownish-gray sandstone; iron-stained, cemented wit iron-oxide, silica, and carbonate, prominently cross bedded, thin to medium bedded, mostly fine-to coarse-grained, mostly moderately to poorly sorted, and includes granular conglomeratic intervals. Reddish-brown and dark-gray shale; very silty, sandy in part, carbon aceous in part, ferrugenous in part. Conglomerate; frameworksupported, granule to pebble, and composed of chert, quartz, and silicic rock fragments. Stuver, Shainin Lake, and Ear Peak Members are obscure, if present. Dark-gray Mississippian(?) shale is not present, or unrecognized. Much of the formation appears transitional to the Noatak Sandstone, especially in the southwestern part of the

WACKE MEMBER of the HUNT FORK SHALE (Brosge and others, 1979) (Upper Devonian) -- Outcrop widths and dip suggest that the wacke member is around 2,500 ft. (760 m) thick. The wacke member appears to thin to the northeast. Siltstone, mudstone, and sandstone. Greenish-gray brownish-gray olive-gray, and medium-dark-gray, siltstone and mudstone; typically brownish-gray and yellowish-brownish-gray, hackly weathering and many manganiferous films on weathered surfaces. Siltstone is very shaly and mudstone grades to siltstone. Light- to medium-olive-gray sandstone; fine-to medium-grained, conglomeratic locally, includes small pebbles and granules of chert, argillite, and ironstone, commonly limonitic, ferruginous-weathering in part, and fossiliferous locally. Fossils typically occur in conglomeratic lenses with plant debris. Sandstone occurs in beds up to 3 feet thick and ranges from wackes containing quartz, chert, mica, and aphanitic rock fragments to quartzites composed of quartz and chert. Load casts and bioturbation are locally common. The wacke member may locally interfinger with the overlying Noatak Sandstone but structural complexities obscure the possible gradational relations between

the wacke member and Noatak Sandstone.

Dhs | SHALE MEMBER of the HUNT FORK SHALE (Brosge and others, 1979) (Upper Devonian) -- Map information suggests that the shale member attains a maximum thickness of 2,000 ft. (610 m) and probably thins to the northeast. Mudstone, shale, and sandstone. Medium-to medium-darkgray mudstone and shale, very silty, fissile, grades to siltstone and slate, interbedded with sandstone. Brownish-gray and greenish-gray sandstone, fine- to medium- grained, but mostly fine-grained, laminated, low-angle cross-bedded, wavy laminated in part, and includes ripple marks, load casts, and few rip-up clasts of dark-gray shale. Sandstones consist of generally well sorted grains of quartz, chert, argillite?, feldspar, and white mica. Sandstone/shale ratios range from 1:5 to 2:3. The unit is structurally thickened and locally involved in imbricate fault blocks. The shale member is probably low grade metamorphosed, because mudstone and shale commonly have a poorly developed axial plane cleavage in the cores of mesoscopic folds; micaceous sheen occurs on bedding and cleavage

Dh HUNT FORK SHALE (Brosge and others, 1979) (Devonian) -- The thickness of this unit is unknown. Shale and sandstone. Medium-dark-gray and olive-gray shale; includes argillite with poorly developed cleavage grades to slate, poorly developed phyllitic sheen on partings, and includes sandstone partings and interbeds. Grayish-green and ripple cross stratified in part, and graded bedded in part. Much of inated is underlain by shaly strata (indicated by pattern on map). Unresolved structural complication precludes determining whether the shale member thickens or there is a facies change to more shaly strata to the southwest and southeastern parts of the map area.

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This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature

